SEQUENCE LISTING

<110> ARCANGEL, Phillip
CHIEN, David Y.

<120> HCV ASSAY

<130> 2300-19199

<150> 60/409,515
<151> 2002-09-09

<160> 9

<170> PatentIn version 3.2

<210> 1
<211> 2058
<212> DNA
<213> Artificial

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<223> NS3/41 conformational epitope DNA sequence

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Met Ala Pro Ile Thr Ala Tyr Ala Gln Gln Thr Arg Gly Leu Leu Gly
  1               5                  10                  15

tgc ata atc acc agc cta act ggc cgg gac aaa aac caa gtg gag ggt      96
Cys Ile Ile Thr Ser Leu Thr Gly Arg Asp Lys Asn Gln Val Glu Gly
             20                  25                  30

gag gtc cag att gtg tca act gct gcc caa acc ttc ctg gca acg tgc     144
Glu Val Gln Ile Val Ser Thr Ala Ala Gln Thr Phe Leu Ala Thr Cys
         35                  40                  45

atc aat ggg gtg tgc tgg act gtc tac cac ggg gcc gga acg agg acc     192
Ile Asn Gly Val Cys Trp Thr Val Tyr His Gly Ala Gly Thr Arg Thr
     50                  55                  60

atc gcg tca ccc aag ggt cct gtc atc cag atg tat acc aat gta gac     240
Ile Ala Ser Pro Lys Gly Pro Val Ile Gln Met Tyr Thr Asn Val Asp
 65                  70                  75                  80

caa gac ctt gtg ggc tgg ccc gct ccg caa ggt agc cga tca ttg aca     288
Gln Asp Leu Val Gly Trp Pro Ala Pro Gln Gly Ser Arg Ser Leu Thr
                 85                  90                  95

ccc tgc act tgc ggc tcc tcg gac ctt tac ctg gtc acg agg cac gcc     336
Pro Cys Thr Cys Gly Ser Ser Asp Leu Tyr Leu Val Thr Arg His Ala
                100                 105                 110

gat gtc att ccc gtg cgc cgg cgg ggt gat agc agg ggc agc ctg ctg     384
Asp Val Ile Pro Val Arg Arg Arg Gly Asp Ser Arg Gly Ser Leu Leu
            115                 120                 125

tcg ccc cgg ccc att tcc tac ttg aaa ggc tcc tcg ggg ggt ccg ctg     432
Ser Pro Arg Pro Ile Ser Tyr Leu Lys Gly Ser Ser Gly Gly Pro Leu
        130                 135                 140
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1

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ttg tgc ccc gcg ggg cac gcc gtg ggc ata ttt agg gcc gcg gtg tgc    480
Leu Cys Pro Ala Gly His Ala Val Gly Ile Phe Arg Ala Ala Val Cys
145             150                 155                 160

acc cgt gga gtg gct aag gcg gtg gac ttt atc cct gtg gag aac cta    528
Thr Arg Gly Val Ala Lys Ala Val Asp Phe Ile Pro Val Glu Asn Leu
                165                 170                 175

gag aca acc atg agg tcc ccg gtg ttc acg gat aac tcc tct cca cca    576
Glu Thr Thr Met Arg Ser Pro Val Phe Thr Asp Asn Ser Ser Pro Pro
            180                 185                 190

gta gtg ccc cag agc ttc cag gtg gct cac ctc cat gct ccc aca ggc    624
Val Val Pro Gln Ser Phe Gln Val Ala His Leu His Ala Pro Thr Gly
            195                 200                 205

agc ggc aaa agc acc aag gtc ccg gct gca tat gca gct cag ggc tat    672
Ser Gly Lys Ser Thr Lys Val Pro Ala Ala Tyr Ala Ala Gln Gly Tyr
            210                 215                 220

aag gtg cta gta ctc aac ccc tct gtt gct gca aca ctg ggc ttt ggt    720
Lys Val Leu Val Leu Asn Pro Ser Val Ala Ala Thr Leu Gly Phe Gly
225             230                 235                 240

gct tac atg tcc aag gct cat ggg atc gat cct aac atc agg acc ggg    768
Ala Tyr Met Ser Lys Ala His Gly Ile Asp Pro Asn Ile Arg Thr Gly
                245                 250                 255

gtg aga aca att acc act ggc agc ccc atc acg tac tcc acc tac ggc    816
Val Arg Thr Ile Thr Thr Gly Ser Pro Ile Thr Tyr Ser Thr Tyr Gly
                260                 265                 270

aag ttc ctt gcc gac ggc ggg tgc tcg ggg ggc gct tat gac ata ata    864
Lys Phe Leu Ala Asp Gly Gly Cys Ser Gly Gly Ala Tyr Asp Ile Ile
                275                 280                 285

att tgt gac gag tgc cac tcc acg gat gcc aca tcc atc ttg ggc att    912
Ile Cys Asp Glu Cys His Ser Thr Asp Ala Thr Ser Ile Leu Gly Ile
        290                 295                 300

ggc act gtc ctt gac caa gca gag act gcg ggg gcg aga ctg gtt gtg    960
Gly Thr Val Leu Asp Gln Ala Glu Thr Ala Gly Ala Arg Leu Val Val
305                 310                 315                 320

ctc gcc acc gcc acc cct ccg ggc tcc gtc act gtg ccc cat ccc aac   1008
Leu Ala Thr Ala Thr Pro Pro Gly Ser Val Thr Val Pro His Pro Asn
                325                 330                 335

atc gag gag gtt gct ctg tcc acc acc gga gag atc cct ttt tac ggc   1056
Ile Glu Glu Val Ala Leu Ser Thr Thr Gly Glu Ile Pro Phe Tyr Gly
                340                 345                 350

aag gct atc ccc ctc gaa gta atc aag ggg ggg aga cat ctc atc ttc   1104
Lys Ala Ile Pro Leu Glu Val Ile Lys Gly Gly Arg His Leu Ile Phe
            355                 360                 365

tgt cat tca aag aag aag tgc gac gaa ctc gcc gca aag ctg gtc gca   1152
Cys His Ser Lys Lys Lys Cys Asp Glu Leu Ala Ala Lys Leu Val Ala
            370                 375                 380

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ttg ggc atc aat gcc gtg gcc tac tac cgc ggt ctt gac gtg tcc gtc     1200
Leu Gly Ile Asn Ala Val Ala Tyr Tyr Arg Gly Leu Asp Val Ser Val
385             390             395             400

atc ccg ccc atc ggc gat gtt gtc gtc gtg gca acc gat gcc ctc atg     1248
Ile Pro Pro Ile Gly Asp Val Val Val Val Ala Thr Asp Ala Leu Met
                405             410             415

acc ggc tat acc ggc gac ttc gac tcg gtg ata gac tgc aat acg tgt     1296
Thr Gly Tyr Thr Gly Asp Phe Asp Ser Val Ile Asp Cys Asn Thr Cys
                420             425             430

gtc acc cag aca gtc gat ttc agc ctt gac cct acc ttc acc att gag     1344
Val Thr Gln Thr Val Asp Phe Ser Leu Asp Pro Thr Phe Thr Ile Glu
        435             440             445

aca atc acg ctc ccc caa gat gct gtc tcc cgc act caa cgt cgg ggc     1392
Thr Ile Thr Leu Pro Gln Asp Ala Val Ser Arg Thr Gln Arg Arg Gly
        450             455             460

agg act ggc agg ggg aag cca ggc atc tac aga ttt gtg gca ccg ggg     1440
Arg Thr Gly Arg Gly Lys Pro Gly Ile Tyr Arg Phe Val Ala Pro Gly
465             470             475             480

gag cgc ccc tcc ggc atg ttc gac tcg tcc gtc ctc tgt gag tgc tat     1488
Glu Arg Pro Ser Gly Met Phe Asp Ser Ser Val Leu Cys Glu Cys Tyr
                485             490             495

gac gca ggc tgt gct tgg tat gag ctc acg ccc gcc gag act aca gtt     1536
Asp Ala Gly Cys Ala Trp Tyr Glu Leu Thr Pro Ala Glu Thr Thr Val
                500             505             510

agg cta cga gcg tac atg aac acc ccg ggg ctt ccc gtg tgc cag gac     1584
Arg Leu Arg Ala Tyr Met Asn Thr Pro Gly Leu Pro Val Cys Gln Asp
        515             520             525

cat ctt gaa ttt tgg gag ggc gtc ttt aca ggc ctc act cat ata gat     1632
His Leu Glu Phe Trp Glu Gly Val Phe Thr Gly Leu Thr His Ile Asp
        530             535             540

gcc cac ttt cta tcc cag aca aag cag agt ggg gag aac ctt cct tac     1680
Ala His Phe Leu Ser Gln Thr Lys Gln Ser Gly Glu Asn Leu Pro Tyr
545             550             555             560

ctg gta gcg tac caa gcc acc gtg tgc gct agg gct caa gcc cct ccc     1728
Leu Val Ala Tyr Gln Ala Thr Val Cys Ala Arg Ala Gln Ala Pro Pro
                565             570             575

cca tcg tgg gac cag atg tgg aag tgt ttg att cgc ctc aag ccc acc     1776
Pro Ser Trp Asp Gln Met Trp Lys Cys Leu Ile Arg Leu Lys Pro Thr
                580             585             590

ctc cat ggg cca aca ccc ctg cta tac aga ctg ggc gct gtt cag aat     1824
Leu His Gly Pro Thr Pro Leu Leu Tyr Arg Leu Gly Ala Val Gln Asn
                595             600             605

gaa atc acc ctg acg cac cca gtc acc aaa tac atc atg aca tgc atg     1872
Glu Ile Thr Leu Thr His Pro Val Thr Lys Tyr Ile Met Thr Cys Met
        610             615             620
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3

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tcg gcc gac ctg gag gtc gtc acg agc acc tgg gtg ctc gtt ggc ggc    1920
Ser Ala Asp Leu Glu Val Val Thr Ser Thr Trp Val Leu Val Gly Gly
625             630             635             640

gtc ctg gct gct ttg gcc gcg tat tgc ctg tca aca ggc tgc gtg gtc    1968
Val Leu Ala Ala Leu Ala Ala Tyr Cys Leu Ser Thr Gly Cys Val Val
                645             650             655

ata gtg ggc agg gtc gtc ttg tcc ggg aag ccg gca atc ata cct gac    2016
Ile Val Gly Arg Val Val Leu Ser Gly Lys Pro Ala Ile Ile Pro Asp
            660             665             670

agg gaa gtc ctc tac cga gag ttc gat gag atg gaa gag tgc            2058
Arg Glu Val Leu Tyr Arg Glu Phe Asp Glu Met Glu Glu Cys
        675             680             685
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Met Ala Pro Ile Thr Ala Tyr Ala Gln Gln Thr Arg Gly Leu Leu Gly
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Cys Ile Ile Thr Ser Leu Thr Gly Arg Asp Lys Asn Gln Val Glu Gly
            20                  25                  30

Glu Val Gln Ile Val Ser Thr Ala Ala Gln Thr Phe Leu Ala Thr Cys
            35                  40                  45

Ile Asn Gly Val Cys Trp Thr Val Tyr His Gly Ala Gly Thr Arg Thr
        50                  55                  60

Ile Ala Ser Pro Lys Gly Pro Val Ile Gln Met Tyr Thr Asn Val Asp
65                  70                  75                  80

Gln Asp Leu Val Gly Trp Pro Ala Pro Gln Gly Ser Arg Ser Leu Thr
                85                  90                  95

Pro Cys Thr Cys Gly Ser Ser Asp Leu Tyr Leu Val Thr Arg His Ala
            100                 105                 110

Asp Val Ile Pro Val Arg Arg Arg Gly Asp Ser Arg Gly Ser Leu Leu
            115                 120                 125

Ser Pro Arg Pro Ile Ser Tyr Leu Lys Gly Ser Ser Gly Gly Pro Leu
        130                 135                 140

Leu Cys Pro Ala Gly His Ala Val Gly Ile Phe Arg Ala Ala Val Cys
145                 150                 155                 160

Thr Arg Gly Val Ala Lys Ala Val Asp Phe Ile Pro Val Glu Asn Leu
                165                 170                 175
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4

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Glu Thr Thr Met Arg Ser Pro Val Phe Thr Asp Asn Ser Ser Pro Pro
            180                 185                 190

Val Val Pro Gln Ser Phe Gln Val Ala His Leu His Ala Pro Thr Gly
            195                 200                 205

Ser Gly Lys Ser Thr Lys Val Pro Ala Ala Tyr Ala Ala Gln Gly Tyr
    210           .         215                 220

Lys Val Leu Val Leu Asn Pro Ser Val Ala Ala Thr Leu Gly Phe Gly
225               230                 235                 240

Ala Tyr Met Ser Lys Ala His Gly Ile Asp Pro Asn Ile Arg Thr Gly
            245                 250                 255

Val Arg Thr Ile Thr Thr Gly Ser Pro Ile Thr Tyr Ser Thr Tyr Gly
            260                 265                 270

Lys Phe Leu Ala Asp Gly Gly Cys Ser Gly Gly Ala Tyr Asp Ile Ile
    275                 280                 285

Ile Cys Asp Glu Cys His Ser Thr Asp Ala Thr Ser Ile Leu Gly Ile
    290                 295                 300

Gly Thr Val Leu Asp Gln Ala Glu Thr Ala Gly Ala Arg Leu Val Val
305               310                 315                 320

Leu Ala Thr Ala Thr Pro Pro Gly Ser Val Thr Val Pro His Pro Asn
            325                 330                 335

Ile Glu Glu Val Ala Leu Ser Thr Thr Gly Glu Ile Pro Phe Tyr Gly
            340                 345                 350

Lys Ala Ile Pro Leu Glu Val Ile Lys Gly Gly Arg His Leu Ile Phe
    355                 360                 365

Cys His Ser Lys Lys Lys Cys Asp Glu Leu Ala Ala Lys Leu Val Ala
    370                 375                 380

Leu Gly Ile Asn Ala Val Ala Tyr Tyr Arg Gly Leu Asp Val Ser Val
385               390                 395                 400

Ile Pro Pro Ile Gly Asp Val Val Val Val Ala Thr Asp Ala Leu Met
            405                 410                 415

Thr Gly Tyr Thr Gly Asp Phe Asp Ser Val Ile Asp Cys Asn Thr Cys
            420                 425                 430

Val Thr Gln Thr Val Asp Phe Ser Leu Asp Pro Thr Phe Thr Ile Glu
            435                 440                 445

Thr Ile Thr Leu Pro Gln Asp Ala Val Ser Arg Thr Gln Arg Arg Gly
    450                 455                 460

Arg Thr Gly Arg Gly Lys Pro Gly Ile Tyr Arg Phe Val Ala Pro Gly
465                 470                 475                 480

Glu Arg Pro Ser Gly Met Phe Asp Ser Ser Val Leu Cys Glu Cys Tyr
            485                 490                 495
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5

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Asp Ala Gly Cys Ala Trp Tyr Glu Leu Thr Pro Ala Glu Thr Thr Val
            500                 505                 510

Arg Leu Arg Ala Tyr Met Asn Thr Pro Gly Leu Pro Val Cys Gln Asp
            515             520             525

His Leu Glu Phe Trp Glu Gly Val Phe Thr Gly Leu Thr His Ile Asp
    530              535             540

Ala His Phe Leu Ser Gln Thr Lys Gln Ser Gly Glu Asn Leu Pro Tyr
545             550             555                 560

Leu Val Ala Tyr Gln Ala Thr Val Cys Ala Arg Ala Gln Ala Pro Pro
                565             570             575

Pro Ser Trp Asp Gln Met Trp Lys Cys Leu Ile Arg Leu Lys Pro Thr
            580             585             590

Leu His Gly Pro Thr Pro Leu Leu Tyr Arg Leu Gly Ala Val Gln Asn
    595                 600             605

Glu Ile Thr Leu Thr His Pro Val Thr Lys Tyr Ile Met Thr Cys Met
    610                 615             620

Ser Ala Asp Leu Glu Val Val Thr Ser Thr Trp Val Leu Val Gly Gly
625             630             635                 640

Val Leu Ala Ala Leu Ala Ala Tyr Cys Leu Ser Thr Gly Cys Val Val
            645             650             655

Ile Val Gly Arg Val Val Leu Ser Gly Lys Pro Ala Ile Ile Pro Asp
            660             665             670

Arg Glu Val Leu Tyr Arg Glu Phe Asp Glu Met Glu Glu Cys
            675             680             685

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<213>   Artificial

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Met Ala Thr Lys Ala Val Cys Val Leu Lys Gly Asp Gly Pro Val Gln
 1               5                  10                  15

ggt att att aac ttc gag cag aag gaa agt aat gga cca gtg aag gtg   96
Gly Ile Ile Asn Phe Glu Gln Lys Glu Ser Asn Gly Pro Val Lys Val
                20              25                  30

tgg gga agc att aaa gga ctg act gaa ggc ctg cat gga ttc cat gtt   144
Trp Gly Ser Ile Lys Gly Leu Thr Glu Gly Leu His Gly Phe His Val
            35              40              45

cat gag ttt gga gat aat aca gca ggc tgt acc agt gca ggt cct cac   192
His Glu Phe Gly Asp Asn Thr Ala Gly Cys Thr Ser Ala Gly Pro His
    50              55              60
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6

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ttt aat cct cta tcc acg cgt ggt tgc aat tgc tct atc tat ccc ggc    240
Phe Asn Pro Leu Ser Thr Arg Gly Cys Asn Cys Ser Ile Tyr Pro Gly
 65                   70                  75                  80

cat ata acg ggt cac cgc atg gca tgg aag ctt ggt tcc gcc gcc aga    288
His Ile Thr Gly His Arg Met Ala Trp Lys Leu Gly Ser Ala Ala Arg
                 85                  90                  95

act acc tcg ggc ttt gtc tcc ttg ttc gcc cca ggt gcc aaa caa aac    336
Thr Thr Ser Gly Phe Val Ser Leu Phe Ala Pro Gly Ala Lys Gln Asn
                100                 105                 110

gaa act cac gtc acg gga ggc gca gcc gcc cga act acg tct ggg ttg    384
Glu Thr His Val Thr Gly Gly Ala Ala Ala Arg Thr Thr Ser Gly Leu
                115                 120                 125

acc tct ttg ttc tcc cca ggt gcc agc caa aac att caa ttg att act    432
Thr Ser Leu Phe Ser Pro Gly Ala Ser Gln Asn Ile Gln Leu Ile Thr
    130                 135                 140

agt acg gat aac tcc tct cca cca gta gtg ccc cag agc ttc cag gtg    480
Ser Thr Asp Asn Ser Ser Pro Pro Val Val Pro Gln Ser Phe Gln Val
145                 150                 155                 160

gct cac ctc cat gct ccc aca ggc agc ggc aaa agc acc aag gtc ccg    528
Ala His Leu His Ala Pro Thr Gly Ser Gly Lys Ser Thr Lys Val Pro
                165                 170                 175

gct gca tat gca gct cag ggc tat aag gtg cta gta ctc aac ccc tct    576
Ala Ala Tyr Ala Ala Gln Gly Tyr Lys Val Leu Val Leu Asn Pro Ser
                180                 185                 190

gtt gct gca aca ctg ggc ttt ggt gct tac atg tcc aag gct cat ggg    624
Val Ala Ala Thr Leu Gly Phe Gly Ala Tyr Met Ser Lys Ala His Gly
    195                 200                 205

atc gat cct aac atc agg acc ggg gtg aga aca att acc act ggc agc    672
Ile Asp Pro Asn Ile Arg Thr Gly Val Arg Thr Ile Thr Thr Gly Ser
    210                 215                 220

ccc atc acg tac tcc acc tac ggc aag ttc ctt gcc gac ggc ggg tgc    720
Pro Ile Thr Tyr Ser Thr Tyr Gly Lys Phe Leu Ala Asp Gly Gly Cys
225                 230                 235                 240

tcg ggg ggc gct tat gac ata ata att tgt gac gag tgc cac tcc acg    768
Ser Gly Gly Ala Tyr Asp Ile Ile Ile Cys Asp Glu Cys His Ser Thr
                245                 250                 255

gat gcc aca tcc atc ttg ggc atc ggc act gtc ctt gac caa gca gag    816
Asp Ala Thr Ser Ile Leu Gly Ile Gly Thr Val Leu Asp Gln Ala Glu
                260                 265                 270

act gcg ggg gcg aga ctg gtt gtg ctc gcc acc gcc acc cct ccg ggc    864
Thr Ala Gly Ala Arg Leu Val Val Leu Ala Thr Ala Thr Pro Pro Gly
    275                 280                 285

tcc gtc act gtg ccc cat ccc aac atc gag gag gtt gct ctg tcc acc    912
Ser Val Thr Val Pro His Pro Asn Ile Glu Glu Val Ala Leu Ser Thr
    290                 295                 300
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7

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acc gga gag atc cct ttt tac ggc aag gct atc ccc ctc gaa gta atc    960
Thr Gly Glu Ile Pro Phe Tyr Gly Lys Ala Ile Pro Leu Glu Val Ile
305                 310                 315                 320

aag ggg ggg aga cat ctc atc ttc tgt cat tca aag aag aag tgc gac    1008
Lys Gly Gly Arg His Leu Ile Phe Cys His Ser Lys Lys Lys Cys Asp
                325                 330                 335

gaa ctc gcc gca aag ctg gtc gca ttg ggc atc aat gcc gtg gcc tac    1056
Glu Leu Ala Ala Lys Leu Val Ala Leu Gly Ile Asn Ala Val Ala Tyr
            340                 345                 350

tac cgc ggt ctt gac gtg tcc gtc atc ccg acc agc ggc gat gtt gtc    1104
Tyr Arg Gly Leu Asp Val Ser Val Ile Pro Thr Ser Gly Asp Val Val
            355                 360                 365

gtc gtg gca acc gat gcc ctc atg acc ggc tat acc ggc gac ttc gac    1152
Val Val Ala Thr Asp Ala Leu Met Thr Gly Tyr Thr Gly Asp Phe Asp
            370                 375                 380

tcg gtg ata gac tgc aat acg tgt gca tgc tcc ggg aag ccg gca atc    1200
Ser Val Ile Asp Cys Asn Thr Cys Ala Cys Ser Gly Lys Pro Ala Ile
385                 390                 395                 400

ata cct gac agg gaa gtc ctc tac cga gag ttc gat gag atg gaa gag    1248
Ile Pro Asp Arg Glu Val Leu Tyr Arg Glu Phe Asp Glu Met Glu Glu
                405                 410                 415

tgc tct cag cac tta ccg tac atc gag caa ggg atg atg ctc gcc gag    1296
Cys Ser Gln His Leu Pro Tyr Ile Glu Gln Gly Met Met Leu Ala Glu
                420                 425                 430

cag ttc aag cag aag gcc ctc ggc ctc tcg cga ggg ggc aag ccg gca    1344
Gln Phe Lys Gln Lys Ala Leu Gly Leu Ser Arg Gly Gly Lys Pro Ala
            435                 440                 445

atc gtt cca gac aaa gag gtg ttg tat caa caa tac gat gag atg gaa    1392
Ile Val Pro Asp Lys Glu Val Leu Tyr Gln Gln Tyr Asp Glu Met Glu
            450                 455                 460

gag tgc tca caa gct gcc cca tat atc gaa caa gct cag gta ata gct    1440
Glu Cys Ser Gln Ala Ala Pro Tyr Ile Glu Gln Ala Gln Val Ile Ala
465                 470                 475                 480

cac cag ttc aag gaa aaa gtc ctt gga ttg atc gat aat gat caa gtg    1488
His Gln Phe Lys Glu Lys Val Leu Gly Leu Ile Asp Asn Asp Gln Val
                485                 490                 495

gtt gtg act cct gac aaa gaa atc tta tat gag gcc ttt gat gag atg    1536
Val Val Thr Pro Asp Lys Glu Ile Leu Tyr Glu Ala Phe Asp Glu Met
            500                 505                 510

gaa gaa tgc gcc tcc aaa gcc gcc ctc att gag gaa ggg cag cgg atg    1584
Glu Glu Cys Ala Ser Lys Ala Ala Leu Ile Glu Glu Gly Gln Arg Met
            515                 520                 525

gcg gag atg ctc aag tct aag ata caa ggc ctc ctc ggg ata ctg cgc    1632
Ala Glu Met Leu Lys Ser Lys Ile Gln Gly Leu Leu Gly Ile Leu Arg
            530                 535                 540
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8

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cgg cac gtt ggt cct ggc gag ggg gca gtg cag tgg atg aac cgg ctg      1680
Arg His Val Gly Pro Gly Glu Gly Ala Val Gln Trp Met Asn Arg Leu
545                     550                 555                 560

ata gcc ttc gcc tcc aga ggg aac cat gtt tcc ccc acg cac tac gtt      1728
Ile Ala Phe Ala Ser Arg Gly Asn His Val Ser Pro Thr His Tyr Val
                    565                 570                 575

ccg tct aga tcc cgg aga ttc gcc cag gcc ctg ccc gtt tgg gcg cgg      1776
Pro Ser Arg Ser Arg Arg Phe Ala Gln Ala Leu Pro Val Trp Ala Arg
                    580                 585                 590

ccg gac tat aac ccc ccg cta gtg gag acg tgg aaa aag ccc gac tac      1824
Pro Asp Tyr Asn Pro Pro Leu Val Glu Thr Trp Lys Lys Pro Asp Tyr
                595                 600                 605

gaa cca cct gtg gtc cac ggc aga tct tct cgg aga ttc gcc cag gcc      1872
Glu Pro Pro Val Val His Gly Arg Ser Ser Arg Arg Phe Ala Gln Ala
    610                 615                 620

ctg ccc gtt tgg gcg cgg ccg gac tat aac ccc ccg cta gtg gag acg      1920
Leu Pro Val Trp Ala Arg Pro Asp Tyr Asn Pro Pro Leu Val Glu Thr
625                 630                 635                 640

tgg aaa aag ccc gac tac gaa cca cct gtg gtc cat ggc aga aag acc      1968
Trp Lys Lys Pro Asp Tyr Glu Pro Pro Val Val His Gly Arg Lys Thr
                645                 650                 655

aaa cgt aac acc aac cgg cgg ccg cag gac gtc aag ttc ccg ggt ggc      2016
Lys Arg Asn Thr Asn Arg Arg Pro Gln Asp Val Lys Phe Pro Gly Gly
                660                 665                 670

ggt cag atc gtt ggt gga gtt tac ttg ttg ccg cgc agg ggc cct aga      2064
Gly Gln Ile Val Gly Gly Val Tyr Leu Leu Pro Arg Arg Gly Pro Arg
                675                 680                 685

ttg ggt gtg ctc gcg acg aga aag act tcc cct atc ccc aag gct cgt      2112
Leu Gly Val Leu Ala Thr Arg Lys Thr Ser Pro Ile Pro Lys Ala Arg
                690                 695                 700

cgg ccc gag ggc agg acc tgg gct cag ccc ggt tac cct tgg ccc ctc      2160
Arg Pro Glu Gly Arg Thr Trp Ala Gln Pro Gly Tyr Pro Trp Pro Leu
705                 710                 715                 720

tat ggc aat aag gac aga cgg tct aca ggt aag tcc tgg ggt aag cca      2208
Tyr Gly Asn Lys Asp Arg Arg Ser Thr Gly Lys Ser Trp Gly Lys Pro
                725                 730                 735

ggg tac cct tgg cca aga aag acc aaa cgt aac acc aac cgg cgg ccg      2256
Gly Tyr Pro Trp Pro Arg Lys Thr Lys Arg Asn Thr Asn Arg Arg Pro
                740                 745                 750

cag gac gtc aag ttc ccg ggt ggc ggt cag atc gtt ggt gga gtt tac      2304
Gln Asp Val Lys Phe Pro Gly Gly Gly Gln Ile Val Gly Gly Val Tyr
                755                 760                 765

ttg ttg ccg cgc agg ggc cct aga ttg ggt gtg ctc gcg acg aga aag      2352
Leu Leu Pro Arg Arg Gly Pro Arg Leu Gly Val Leu Ala Thr Arg Lys
    770                 775                 780
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9

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act tcc cct atc ccc aag gct cgt cgg ccc gag ggc agg acc tgg gct    2400
Thr Ser Pro Ile Pro Lys Ala Arg Arg Pro Glu Gly Arg Thr Trp Ala
785             790             795             800

cag ccc ggt tac cct tgg ccc ctc tat ggc aat aag gac aga cgg tct    2448
Gln Pro Gly Tyr Pro Trp Pro Leu Tyr Gly Asn Lys Asp Arg Arg Ser
            805             810             815

aca ggt aag tcc tgg ggt aag cca ggg tac cct tgg ccc taatgagtcg ac 2499
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<211> 829
<212> PRT
<213> Artificial

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<223> MEFA 12 amino acid sequence

<400> 4

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Met Ala Thr Lys Ala Val Cys Val Leu Lys Gly Asp Gly Pro Val Gln
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Gly Ile Ile Asn Phe Glu Gln Lys Glu Ser Asn Gly Pro Val Lys Val
            20              25              30

Trp Gly Ser Ile Lys Gly Leu Thr Glu Gly Leu His Gly Phe His Val
          35              40              45

His Glu Phe Gly Asp Asn Thr Ala Gly Cys Thr Ser Ala Gly Pro His
     50              55              60

Phe Asn Pro Leu Ser Thr Arg Gly Cys Asn Cys Ser Ile Tyr Pro Gly
 65              70              75              80

His Ile Thr Gly His Arg Met Ala Trp Lys Leu Gly Ser Ala Ala Arg
            85              90              95

Thr Thr Ser Gly Phe Val Ser Leu Phe Ala Pro Gly Ala Lys Gln Asn
          100             105             110

Glu Thr His Val Thr Gly Gly Ala Ala Ala Arg Thr Thr Ser Gly Leu
          115             120             125

Thr Ser Leu Phe Ser Pro Gly Ala Ser Gln Asn Ile Gln Leu Ile Thr
          130             135             140

Ser Thr Asp Asn Ser Ser Pro Pro Val Val Pro Gln Ser Phe Gln Val
145             150             155             160

Ala His Leu His Ala Pro Thr Gly Ser Gly Lys Ser Thr Lys Val Pro
                165             170             175

Ala Ala Tyr Ala Ala Gln Gly Tyr Lys Val Leu Val Leu Asn Pro Ser
            180             185             190

Val Ala Ala Thr Leu Gly Phe Gly Ala Tyr Met Ser Lys Ala His Gly
          195             200             205
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10

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Ile Asp Pro Asn Ile Arg Thr Gly Val Arg Thr Ile Thr Thr Gly Ser
    210             215             220

Pro Ile Thr Tyr Ser Thr Tyr Gly Lys Phe Leu Ala Asp Gly Gly Cys
225             230             235                     240

Ser Gly Gly Ala Tyr Asp Ile Ile Ile Cys Asp Glu Cys His Ser Thr
                245             250             255

Asp Ala Thr Ser Ile Leu Gly Ile Gly Thr Val Leu Asp Gln Ala Glu
                260             265             270

Thr Ala Gly Ala Arg Leu Val Val Leu Ala Thr Ala Thr Pro Pro Gly
        275             280             285

Ser Val Thr Val Pro His Pro Asn Ile Glu Glu Val Ala Leu Ser Thr
    290             295             300

Thr Gly Glu Ile Pro Phe Tyr Gly Lys Ala Ile Pro Leu Glu Val Ile
305             310             315                     320

Lys Gly Gly Arg His Leu Ile Phe Cys His Ser Lys Lys Lys Cys Asp
                325             330             335

Glu Leu Ala Ala Lys Leu Val Ala Leu Gly Ile Asn Ala Val Ala Tyr
        340             345             350

Tyr Arg Gly Leu Asp Val Ser Val Ile Pro Thr Ser Gly Asp Val Val
        355             360             365

Val Val Ala Thr Asp Ala Leu Met Thr Gly Tyr Thr Gly Asp Phe Asp
    370             375             380

Ser Val Ile Asp Cys Asn Thr Cys Ala Cys Ser Gly Lys Pro Ala Ile
385             390             395                     400

Ile Pro Asp Arg Glu Val Leu Tyr Arg Glu Phe Asp Glu Met Glu Glu
                405             410             415

Cys Ser Gln His Leu Pro Tyr Ile Glu Gln Gly Met Met Leu Ala Glu
                420             425             430

Gln Phe Lys Gln Lys Ala Leu Gly Leu Ser Arg Gly Gly Lys Pro Ala
        435             440             445

Ile Val Pro Asp Lys Glu Val Leu Tyr Gln Gln Tyr Asp Glu Met Glu
    450             455             460

Glu Cys Ser Gln Ala Ala Pro Tyr Ile Glu Gln Ala Gln Val Ile Ala
465             470             475                     480

His Gln Phe Lys Glu Lys Val Leu Gly Leu Ile Asp Asn Asp Gln Val
                485             490             495

Val Val Thr Pro Asp Lys Glu Ile Leu Tyr Glu Ala Phe Asp Glu Met
        500             505             510

Glu Glu Cys Ala Ser Lys Ala Ala Leu Ile Glu Glu Gly Gln Arg Met
        515             520             525
```

11

```
Ala Glu Met Leu Lys Ser Lys Ile Gln Gly Leu Leu Gly Ile Leu Arg
    530             535             540

Arg His Val Gly Pro Gly Glu Gly Ala Val Gln Trp Met Asn Arg Leu
545             550             555             560

Ile Ala Phe Ala Ser Arg Gly Asn His Val Ser Pro Thr His Tyr Val
            565             570             575

Pro Ser Arg Ser Arg Arg Phe Ala Gln Ala Leu Pro Val Trp Ala Arg
            580             585             590

Pro Asp Tyr Asn Pro Pro Leu Val Glu Thr Trp Lys Lys Pro Asp Tyr
    595             600             605

Glu Pro Pro Val Val His Gly Arg Ser Ser Arg Arg Phe Ala Gln Ala
    610             615             620

Leu Pro Val Trp Ala Arg Pro Asp Tyr Asn Pro Pro Leu Val Glu Thr
625             630             635             640

Trp Lys Lys Pro Asp Tyr Glu Pro Pro Val Val His Gly Arg Lys Thr
            645             650             655

Lys Arg Asn Thr Asn Arg Arg Pro Gln Asp Val Lys Phe Pro Gly Gly
            660             665             670

Gly Gln Ile Val Gly Gly Val Tyr Leu Leu Pro Arg Arg Gly Pro Arg
        675             680             685

Leu Gly Val Leu Ala Thr Arg Lys Thr Ser Pro Ile Pro Lys Ala Arg
    690             695             700

Arg Pro Glu Gly Arg Thr Trp Ala Gln Pro Gly Tyr Pro Trp Pro Leu
705             710             715             720

Tyr Gly Asn Lys Asp Arg Arg Ser Thr Gly Lys Ser Trp Gly Lys Pro
            725             730             735

Gly Tyr Pro Trp Pro Arg Lys Thr Lys Arg Asn Thr Asn Arg Arg Pro
            740             745             750

Gln Asp Val Lys Phe Pro Gly Gly Gly Gln Ile Val Gly Gly Val Tyr
    755             760             765

Leu Leu Pro Arg Arg Gly Pro Arg Leu Gly Val Leu Ala Thr Arg Lys
    770             775             780

Thr Ser Pro Ile Pro Lys Ala Arg Arg Pro Glu Gly Arg Thr Trp Ala
785             790             795             800

Gln Pro Gly Tyr Pro Trp Pro Leu Tyr Gly Asn Lys Asp Arg Arg Ser
            805             810             815

Thr Gly Lys Ser Trp Gly Lys Pro Gly Tyr Pro Trp Pro
            820             825
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12

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<212> Artificial

<211> 3297
<212> DNA
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<220>
<223> MEFA 7.1 DNA sequence

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atg gct aca aag gct gtt tgt gtt ttg aag ggt gac ggc cca gtt caa   48
Met Ala Thr Lys Ala Val Cys Val Leu Lys Gly Asp Gly Pro Val Gln
  1   5   10   15

ggt att att aac ttc gag cag aag gaa agt aat gga cca gtg aag gtg   96
Gly Ile Ile Asn Phe Glu Gln Lys Glu Ser Asn Gly Pro Val Lys Val
             20   25   30

tgg gga agc att aaa gga ctg act gaa ggc ctg cat gga ttc cat gtt   144
Trp Gly Ser Ile Lys Gly Leu Thr Glu Gly Leu His Gly Phe His Val
             35   40   45

cat gag ttt gga gat aat aca gca ggc tgt acc agt gca ggt cct cac   192
His Glu Phe Gly Asp Asn Thr Ala Gly Cys Thr Ser Ala Gly Pro His
         50   55   60

ttt aat cct cta tcc aga aaa cac ggt ggg cca aag gat gaa gag agg   240
Phe Asn Pro Leu Ser Arg Lys His Gly Gly Pro Lys Asp Glu Glu Arg
 65   70   75   80

cat gtt gga gac ttg ggc aat gtg act gct gac aaa gat ggt gtg gcc   288
His Val Gly Asp Leu Gly Asn Val Thr Ala Asp Lys Asp Gly Val Ala
                 85   90   95

gat gtg tct att gaa gat tct gtg atc tca ctc tca gga gac cat tgc   336
Asp Val Ser Ile Glu Asp Ser Val Ile Ser Leu Ser Gly Asp His Cys
                100   105   110

atc att ggc cgc aca ctg gtg gtc cat gaa aaa gca gat gac ttg ggc   384
Ile Ile Gly Arg Thr Leu Val Val His Glu Lys Ala Asp Asp Leu Gly
            115   120   125

aaa ggt gga aat gaa gaa agt aca aag aca gga aac gct gga agt cgt   432
Lys Gly Gly Asn Glu Glu Ser Thr Lys Thr Gly Asn Ala Gly Ser Arg
        130   135   140

ttg gct tgt ggt gta att ggg atc gcc cag aat ttg aat tct ggt tgc   480
Leu Ala Cys Gly Val Ile Gly Ile Ala Gln Asn Leu Asn Ser Gly Cys
145   150   155   160

aat tgc tct atc tat ccc ggc cat ata acg ggt cac cgc atg gca tgg   528
Asn Cys Ser Ile Tyr Pro Gly His Ile Thr Gly His Arg Met Ala Trp
                165   170   175

aag ctt ggt tcc gcc gcc aga act acc tcg ggc ttt gtc tcc ttg ttc   576
Lys Leu Gly Ser Ala Ala Arg Thr Thr Ser Gly Phe Val Ser Leu Phe
                180   185   190

gcc cca ggt gcc aaa caa aac gaa act cac gtc acg gga ggc gca gcc   624
Ala Pro Gly Ala Lys Gln Asn Glu Thr His Val Thr Gly Gly Ala Ala
                195   200   205

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gcc cga act acg tct ggg ttg acc tct ttg ttc tcc cca ggt gcc agc    672
Ala Arg Thr Thr Ser Gly Leu Thr Ser Leu Phe Ser Pro Gly Ala Ser
    210             215             220

caa aac att caa ttg att gtc gac ttt atc cct gtg gag aac cta gag    720
Gln Asn Ile Gln Leu Ile Val Asp Phe Ile Pro Val Glu Asn Leu Glu
225             230             235             240

aca acc atg cga tct ccg gtg ttc acg gat aac tcc tct cca cca gta    768
Thr Thr Met Arg Ser Pro Val Phe Thr Asp Asn Ser Ser Pro Pro Val
            245             250             255

gtg ccc cag agc ttc cag gtg gct cac ctc cat gct ccc aca ggc agc    816
Val Pro Gln Ser Phe Gln Val Ala His Leu His Ala Pro Thr Gly Ser
            260             265             270

ggc aaa agc acc aag gtc ccg gct gca tat gca gct cag ggc tat aag    864
Gly Lys Ser Thr Lys Val Pro Ala Ala Tyr Ala Ala Gln Gly Tyr Lys
            275             280             285

gtg cta gta ctc aac ccc tct gtt gct gca aca ctg ggc ttt ggt gct    912
Val Leu Val Leu Asn Pro Ser Val Ala Ala Thr Leu Gly Phe Gly Ala
            290             295             300

tac atg tcc aag gct cat ggg atc gat cct aac atc agg acc ggg gtg    960
Tyr Met Ser Lys Ala His Gly Ile Asp Pro Asn Ile Arg Thr Gly Val
305             310             315             320

aga aca att acc act ggc agc ccc atc acg tac tcc acc tac ggc aag   1008
Arg Thr Ile Thr Thr Gly Ser Pro Ile Thr Tyr Ser Thr Tyr Gly Lys
            325             330             335

ttc ctt gcc gac ggc ggg tgc tcg ggg ggc gct tat gac ata ata att   1056
Phe Leu Ala Asp Gly Gly Cys Ser Gly Gly Ala Tyr Asp Ile Ile Ile
            340             345             350

tgt gac gag tgc cac tcc acg gat gcc aca tcc atc ttg ggc att ggc   1104
Cys Asp Glu Cys His Ser Thr Asp Ala Thr Ser Ile Leu Gly Ile Gly
            355             360             365

act gtc ctt gac caa gca gag act gcg ggg gcg aga ctg gtt gtg ctc   1152
Thr Val Leu Asp Gln Ala Glu Thr Ala Gly Ala Arg Leu Val Val Leu
            370             375             380

gcc acc gcc acc cct ccg ggc tcc gtc act gtg ccc cat ccc aac atc   1200
Ala Thr Ala Thr Pro Pro Gly Ser Val Thr Val Pro His Pro Asn Ile
385             390             395             400

gag gag gtt gct ctg tcc acc acc gga gag atc cct ttt tac ggc aag   1248
Glu Glu Val Ala Leu Ser Thr Thr Gly Glu Ile Pro Phe Tyr Gly Lys
            405             410             415

gct atc ccc ctc gaa gta atc aag ggg ggg aga cat ctc atc ttc tgt   1296
Ala Ile Pro Leu Glu Val Ile Lys Gly Gly Arg His Leu Ile Phe Cys
            420             425             430

cat tca aag aag aag tgc gac gaa ctc gcc gca aag ctg gtc gca ttg   1344
His Ser Lys Lys Lys Cys Asp Glu Leu Ala Ala Lys Leu Val Ala Leu
            435             440             445
```

14

```
ggc atc aat gcc gtg gcc tac tac cgc ggt ctt gac gtg tcc gtc atc      1392
Gly Ile Asn Ala Val Ala Tyr Tyr Arg Gly Leu Asp Val Ser Val Ile
    450             455             460

ccg acc agc ggc gat gtt gtc gtc gtg gca acc gat gcc ctc atg acc      1440
Pro Thr Ser Gly Asp Val Val Val Val Ala Thr Asp Ala Leu Met Thr
465             470             475             480

ggc tat acc ggc gac ttc gac tcg gtg ata gac tgc aat acg tgt gtc      1488
Gly Tyr Thr Gly Asp Phe Asp Ser Val Ile Asp Cys Asn Thr Cys Val
                485             490             495

acc cag aca gtc gat ttc agc ctt gac cct acc ttc acc att gag aca      1536
Thr Gln Thr Val Asp Phe Ser Leu Asp Pro Thr Phe Thr Ile Glu Thr
                500             505             510

atc acg ctc ccc caa gat gct gtc tcc cgc act caa cgt cgg ggc agg      1584
Ile Thr Leu Pro Gln Asp Ala Val Ser Arg Thr Gln Arg Arg Gly Arg
        515             520             525

act ggc agg ggg aag cca ggc atc tac aga ttt gtg gca ccg ggg gag      1632
Thr Gly Arg Gly Lys Pro Gly Ile Tyr Arg Phe Val Ala Pro Gly Glu
        530             535             540

cgc ccc tcc ggc atg ttc gac tcg tcc gtc ctc tgt gag tgc tat gac      1680
Arg Pro Ser Gly Met Phe Asp Ser Ser Val Leu Cys Glu Cys Tyr Asp
545             550             555             560

gca ggc tgt gct tgg tat gag ctc acg ccc gcc gag act aca gtt agg      1728
Ala Gly Cys Ala Trp Tyr Glu Leu Thr Pro Ala Glu Thr Thr Val Arg
                565             570             575

cta cga gcg tac atg aac acc ccg ggg ctt ccc gtg tgc cag gac cat      1776
Leu Arg Ala Tyr Met Asn Thr Pro Gly Leu Pro Val Cys Gln Asp His
                580             585             590

ctt gaa ttt tgg gag ggc gtc ttt aca ggc ctc act cat ata gat gcc      1824
Leu Glu Phe Trp Glu Gly Val Phe Thr Gly Leu Thr His Ile Asp Ala
            595             600             605

cac ttt cta tcc cag aca aag cag agt ggg gag aac ctt cct tac ctg      1872
His Phe Leu Ser Gln Thr Lys Gln Ser Gly Glu Asn Leu Pro Tyr Leu
        610             615             620

gta gcg tac caa gcc acc gtg tgc gct agg gct caa gcc cct ccc cca      1920
Val Ala Tyr Gln Ala Thr Val Cys Ala Arg Ala Gln Ala Pro Pro Pro
625             630             635             640

tcg tgg gac cag atg tgg aag tgt ttg att cgc ctc aag ccc acc ctc      1968
Ser Trp Asp Gln Met Trp Lys Cys Leu Ile Arg Leu Lys Pro Thr Leu
                645             650             655

cat ggg cca aca ccc ctg cta tac aga ctg ggc gct gtt cag aat gaa      2016
His Gly Pro Thr Pro Leu Leu Tyr Arg Leu Gly Ala Val Gln Asn Glu
                660             665             670

atc acc ctg acg cac cca gtc acc aaa tac atc atg aca tgc atg tcg      2064
Ile Thr Leu Thr His Pro Val Thr Lys Tyr Ile Met Thr Cys Met Ser
        675             680             685
```

15

```
gcc gac ctg gag gtc gtc acg agc gca tgc tcc ggg aag ccg gca atc     2112
Ala Asp Leu Glu Val Val Thr Ser Ala Cys Ser Gly Lys Pro Ala Ile
    690                     695                 700

ata cct gac agg gaa gtc ctc tac cga gag ttc gat gag atg gaa gag     2160
Ile Pro Asp Arg Glu Val Leu Tyr Arg Glu Phe Asp Glu Met Glu Glu
705                     710                 715                 720

tgc tct cag cac tta ccg tac atc gag caa ggg atg atg ctc gcc gag     2208
Cys Ser Gln His Leu Pro Tyr Ile Glu Gln Gly Met Met Leu Ala Glu
                    725                 730                 735

cag ttc aag cag aag gcc ctc ggc ctc tcg cga ggg ggc aag ccg gca     2256
Gln Phe Lys Gln Lys Ala Leu Gly Leu Ser Arg Gly Gly Lys Pro Ala
                740                 745                 750

atc gtt cca gac aaa gag gtg ttg tat caa caa tac gat gag atg gaa     2304
Ile Val Pro Asp Lys Glu Val Leu Tyr Gln Gln Tyr Asp Glu Met Glu
            755                 760                 765

gag tgc tca caa gct gcc cca tat atc gaa caa gct cag gta ata gct     2352
Glu Cys Ser Gln Ala Ala Pro Tyr Ile Glu Gln Ala Gln Val Ile Ala
    770                 775                 780

cac cag ttc aag gaa aaa gtc ctt gga ttg atc gat aat gat caa gtg     2400
His Gln Phe Lys Glu Lys Val Leu Gly Leu Ile Asp Asn Asp Gln Val
785                 790                 795                 800

gtt gtg act cct gac aaa gaa atc tta tat gag gcc ttt gat gag atg     2448
Val Val Thr Pro Asp Lys Glu Ile Leu Tyr Glu Ala Phe Asp Glu Met
                805                 810                 815

gaa gaa tgc gcc tcc aaa gcc gcc ctc att gag gaa ggg cag cgg atg     2496
Glu Glu Cys Ala Ser Lys Ala Ala Leu Ile Glu Glu Gly Gln Arg Met
            820                 825                 830

gcg gag atg ctc aag tct aag ata caa ggc ctc ctc ggg ata ctg cgc     2544
Ala Glu Met Leu Lys Ser Lys Ile Gln Gly Leu Leu Gly Ile Leu Arg
        835                 840                 845

cgg cac gtt ggt cct ggc gag ggg gca gtg cag tgg atg aac cgg ctg     2592
Arg His Val Gly Pro Gly Glu Gly Ala Val Gln Trp Met Asn Arg Leu
    850                 855                 860

ata gcc ttc gcc tcc aga ggg aac cat gtt tcc ccc acg cac tac gtt     2640
Ile Ala Phe Ala Ser Arg Gly Asn His Val Ser Pro Thr His Tyr Val
865                 870                 875                 880

ccg tct aga tcc cgg aga ttc gcc cag gcc ctg ccc gtt tgg gcg cgg     2688
Pro Ser Arg Ser Arg Arg Phe Ala Gln Ala Leu Pro Val Trp Ala Arg
                885                 890                 895

ccg gac tat aac ccc ccg cta gtg gag acg tgg aaa aag ccc gac tac     2736
Pro Asp Tyr Asn Pro Pro Leu Val Glu Thr Trp Lys Lys Pro Asp Tyr
                900                 905                 910

gaa cca cct gtg gtc cac ggc aga tct tct cgg aga ttc gcc cag gcc     2784
Glu Pro Pro Val Val His Gly Arg Ser Ser Arg Arg Phe Ala Gln Ala
            915                 920                 925
```

16

```
ctg ccc gtt tgg gcg cgg ccg gac tat aac ccc ccg cta gtg gag acg    2832
Leu Pro Val Trp Ala Arg Pro Asp Tyr Asn Pro Pro Leu Val Glu Thr
    930                 935                 940

tgg aaa aag ccc gac tac gaa cca cct gtg gtc cat ggc aga aag acc    2880
Trp Lys Lys Pro Asp Tyr Glu Pro Pro Val Val His Gly Arg Lys Thr
945                 950                 955                 960

aaa cgt aac acc aac cgg cgg ccg cag gac gtc aag ttc ccg ggt ggc    2928
Lys Arg Asn Thr Asn Arg Arg Pro Gln Asp Val Lys Phe Pro Gly Gly
                965                 970                 975

ggt cag atc gtt ggt cgc agg ggc cct cct atc ccc aag gct cgt cgg    2976
Gly Gln Ile Val Gly Arg Arg Gly Pro Pro Ile Pro Lys Ala Arg Arg
                980                 985                 990

ccc gag ggc agg acc tgg gct cag ccc ggt tac cct tgg ccc ctc tat    3024
Pro Glu Gly Arg Thr Trp Ala Gln Pro Gly Tyr Pro Trp Pro Leu Tyr
            995                 1000                1005

ggc aat aag gac aga cgg tct aca ggt aag tcc tgg ggt aag cca ggg    3072
Gly Asn Lys Asp Arg Arg Ser Thr Gly Lys Ser Trp Gly Lys Pro Gly
    1010                1015                1020

tac cct tgg cca aga aag acc aaa cgt aac acc aac cga cgg ccg cag    3120
Tyr Pro Trp Pro Arg Lys Thr Lys Arg Asn Thr Asn Arg Arg Pro Gln
1025                1030                1035                1040

gac gtc aag ttc ccg ggt ggc ggt cag atc gtt ggt cgc agg ggc cct    3168
Asp Val Lys Phe Pro Gly Gly Gly Gln Ile Val Gly Arg Arg Gly Pro
                1045                1050                1055

cct atc ccc aag gct cgt cgg ccc gag ggc agg acc tgg gct cag ccc    3216
Pro Ile Pro Lys Ala Arg Arg Pro Glu Gly Arg Thr Trp Ala Gln Pro
                1060                1065                1070

ggt tac cct tgg ccc ctc tat ggc aat aag gac aga cgg tct acc ggt    3264
Gly Tyr Pro Trp Pro Leu Tyr Gly Asn Lys Asp Arg Arg Ser Thr Gly
            1075                1080                1085

aag tcc tgg ggt aag cca ggg tat cct tgg ccc                        3297
Lys Ser Trp Gly Lys Pro Gly Tyr Pro Trp Pro
    1090                1095


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<212>   PRT
<213>   Artificial

<220>
<223>   MEFA 7.1 amino acid sequence

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Met Ala Thr Lys Ala Val Cys Val Leu Lys Gly Asp Gly Pro Val Gln
  1             5                  10                  15

Gly Ile Ile Asn Phe Glu Gln Lys Glu Ser Asn Gly Pro Val Lys Val
              20                  25                  30
```

17

```
Trp Gly Ser Ile Lys Gly Leu Thr Glu Gly Leu His Gly Phe His Val
        35              40              45
His Glu Phe Gly Asp Asn Thr Ala Gly Cys Thr Ser Ala Gly Pro His
        50              55              60
Phe Asn Pro Leu Ser Arg Lys His Gly Gly Pro Lys Asp Glu Glu Arg
65              70              75              80
His Val Gly Asp Leu Gly Asn Val Thr Ala Asp Lys Asp Gly Val Ala
                85              90              95
Asp Val Ser Ile Glu Asp Ser Val Ile Ser Leu Ser Gly Asp His Cys
            100             105             110
Ile Ile Gly Arg Thr Leu Val Val His Glu Lys Ala Asp Asp Leu Gly
        115             120             125
Lys Gly Gly Asn Glu Glu Ser Thr Lys Thr Gly Asn Ala Gly Ser Arg
    130             135             140
Leu Ala Cys Gly Val Ile Gly Ile Ala Gln Asn Leu Asn Ser Gly Cys
145             150             155             160
Asn Cys Ser Ile Tyr Pro Gly His Ile Thr Gly His Arg Met Ala Trp
                165             170             175
Lys Leu Gly Ser Ala Ala Arg Thr Thr Ser Gly Phe Val Ser Leu Phe
            180             185             190
Ala Pro Gly Ala Lys Gln Asn Glu Thr His Val Thr Gly Gly Ala Ala
        195             200             205
Ala Arg Thr Thr Ser Gly Leu Thr Ser Leu Phe Ser Pro Gly Ala Ser
    210             215             220
Gln Asn Ile Gln Leu Ile Val Asp Phe Ile Pro Val Glu Asn Leu Glu
225             230             235             240
Thr Thr Met Arg Ser Pro Val Phe Thr Asp Asn Ser Ser Pro Pro Val
            245             250             255
Val Pro Gln Ser Phe Gln Val Ala His Leu His Ala Pro Thr Gly Ser
            260             265             270
Gly Lys Ser Thr Lys Val Pro Ala Ala Tyr Ala Ala Gln Gly Tyr Lys
        275             280             285
Val Leu Val Leu Asn Pro Ser Val Ala Ala Thr Leu Gly Phe Gly Ala
    290             295             300
```

18

```
Tyr Met Ser Lys Ala His Gly Ile Asp Pro Asn Ile Arg Thr Gly Val
305                 310                 315                 320

Arg Thr Ile Thr Thr Gly Ser Pro Ile Thr Tyr Ser Thr Tyr Gly Lys
            325                 330                 335

Phe Leu Ala Asp Gly Gly Cys Ser Gly Gly Ala Tyr Asp Ile Ile Ile
            340             345                 350

Cys Asp Glu Cys His Ser Thr Asp Ala Thr Ser Ile Leu Gly Ile Gly
        355                 360                 365

Thr Val Leu Asp Gln Ala Glu Thr Ala Gly Ala Arg Leu Val Val Leu
    370                 375                 380

Ala Thr Ala Thr Pro Pro Gly Ser Val Thr Val Pro His Pro Asn Ile
385                 390                 395                 400

Glu Glu Val Ala Leu Ser Thr Thr Gly Glu Ile Pro Phe Tyr Gly Lys
            405                 410                 415

Ala Ile Pro Leu Glu Val Ile Lys Gly Gly Arg His Leu Ile Phe Cys
            420             425                 430

His Ser Lys Lys Lys Cys Asp Glu Leu Ala Ala Lys Leu Val Ala Leu
        435                 440                 445

Gly Ile Asn Ala Val Ala Tyr Tyr Arg Gly Leu Asp Val Ser Val Ile
    450                 455                 460

Pro Thr Ser Gly Asp Val Val Val Val Ala Thr Asp Ala Leu Met Thr
465                 470                 475                 480

Gly Tyr Thr Gly Asp Phe Asp Ser Val Ile Asp Cys Asn Thr Cys Val
            485                 490                 495

Thr Gln Thr Val Asp Phe Ser Leu Asp Pro Thr Phe Thr Ile Glu Thr
            500                 505                 510

Ile Thr Leu Pro Gln Asp Ala Val Ser Arg Thr Gln Arg Arg Gly Arg
        515                 520                 525

Thr Gly Arg Gly Lys Pro Gly Ile Tyr Arg Phe Val Ala Pro Gly Glu
    530                 535                 540

Arg Pro Ser Gly Met Phe Asp Ser Ser Val Leu Cys Glu Cys Tyr Asp
545                 550                 555                 560

Ala Gly Cys Ala Trp Tyr Glu Leu Thr Pro Ala Glu Thr Thr Val Arg
            565                 570                 575

Leu Arg Ala Tyr Met Asn Thr Pro Gly Leu Pro Val Cys Gln Asp His
            580                 585                 590

Leu Glu Phe Trp Glu Gly Val Phe Thr Gly Leu Thr His Ile Asp Ala
            595                 600                 605
```

19

```
His Phe Leu Ser Gln Thr Lys Gln Ser Gly Glu Asn Leu Pro Tyr Leu
    610             615             620

Val Ala Tyr Gln Ala Thr Val Cys Ala Arg Ala Gln Ala Pro Pro Pro
625             630             635             640

Ser Trp Asp Gln Met Trp Lys Cys Leu Ile Arg Leu Lys Pro Thr Leu
            645             650             655

His Gly Pro Thr Pro Leu Leu Tyr Arg Leu Gly Ala Val Gln Asn Glu
            660             665             670

Ile Thr Leu Thr His Pro Val Thr Lys Tyr Ile Met Thr Cys Met Ser
        675             680             685

Ala Asp Leu Glu Val Val Thr Ser Ala Cys Ser Gly Lys Pro Ala Ile
    690             695             700

Ile Pro Asp Arg Glu Val Leu Tyr Arg Glu Phe Asp Glu Met Glu Glu
705             710             715             720

Cys Ser Gln His Leu Pro Tyr Ile Glu Gln Gly Met Met Leu Ala Glu
            725             730             735

Gln Phe Lys Gln Lys Ala Leu Gly Leu Ser Arg Gly Gly Lys Pro Ala
            740             745             750

Ile Val Pro Asp Lys Glu Val Leu Tyr Gln Gln Tyr Asp Glu Met Glu
        755             760             765

Glu Cys Ser Gln Ala Ala Pro Tyr Ile Glu Gln Ala Gln Val Ile Ala
    770             775             780

His Gln Phe Lys Glu Lys Val Leu Gly Leu Ile Asp Asn Asp Gln Val
785             790             795             800

Val Val Thr Pro Asp Lys Glu Ile Leu Tyr Glu Ala Phe Asp Glu Met
            805             810             815

Glu Glu Cys Ala Ser Lys Ala Ala Leu Ile Glu Glu Gly Gln Arg Met
            820             825             830

Ala Glu Met Leu Lys Ser Lys Ile Gln Gly Leu Leu Gly Ile Leu Arg
        835             840             845

Arg His Val Gly Pro Gly Glu Gly Ala Val Gln Trp Met Asn Arg Leu
    850             855             860

Ile Ala Phe Ala Ser Arg Gly Asn His Val Ser Pro Thr His Tyr Val
865             870             875             880

Pro Ser Arg Ser Arg Arg Phe Ala Gln Ala Leu Pro Val Trp Ala Arg
            885             890             895

Pro Asp Tyr Asn Pro Pro Leu Val Glu Thr Trp Lys Lys Pro Asp Tyr
            900             905             910
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20

```
Glu Pro Pro Val Val His Gly Arg Ser Ser Arg Arg Phe Ala Gln Ala
    915             920             925

Leu Pro Val Trp Ala Arg Pro Asp Tyr Asn Pro Pro Leu Val Glu Thr
    930             935             940

Trp Lys Lys Pro Asp Tyr Glu Pro Pro Val Val His Gly Arg Lys Thr
945             950             955             960

Lys Arg Asn Thr Asn Arg Arg Pro Gln Asp Val Lys Phe Pro Gly Gly
            965             970             975

Gly Gln Ile Val Gly Arg Arg Gly Pro Pro Ile Pro Lys Ala Arg Arg
            980             985             990

Pro Glu Gly Arg Thr Trp Ala Gln Pro Gly Tyr Pro Trp Pro Leu Tyr
        995             1000            1005

Gly Asn Lys Asp Arg Arg Ser Thr Gly Lys Ser Trp Gly Lys Pro Gly
    1010            1015            1020

Tyr Pro Trp Pro Arg Lys Thr Lys Arg Asn Thr Asn Arg Arg Pro Gln
1025            1030            1035            1040

Asp Val Lys Phe Pro Gly Gly Gly Gln Ile Val Gly Arg Arg Gly Pro
            1045            1050            1055

Pro Ile Pro Lys Ala Arg Arg Pro Glu Gly Arg Thr Trp Ala Gln Pro
            1060            1065            1070

Gly Tyr Pro Trp Pro Leu Tyr Gly Asn Lys Asp Arg Arg Ser Thr Gly
        1075            1080            1085

Lys Ser Trp Gly Lys Pro Gly Tyr Pro Trp Pro
    1090            1095

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<212>   PRT
<213>   Artificial

<220>
<223>   consensus   sequence

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Gly Ser Ala Ala Arg Thr Thr Ser Gly Phe Val Ser Leu Phe Ala Pro
1               5               10              15


Gly Ala Lys Gln Asn
            20


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<211>   10
<212>   DNA
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21

<210> Artificial

<220>
<223> sequence following HindIII site

<400> 8
acaaaacaaa   10

<210> 9
<211> 23
<212> PRT
<213> Artificial

<220>
<223> NS4A peptide

<400> 9

Lys Lys Gly Ser Val Val Ile Val Gly Arg Ile Val Leu Ser Gly Lys
1   5   10   15

Pro Ala Ile Ile Pro Lys Lys
            20